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II.—*Aufenthalt und Reisen in Mexico.* [*Residence and Jour-  
nies in Mexico between the Years 1825 and 1834, &c.*] By  
JOSEPH BURKART. Stuttgart. 1836. Communicated by  
MAJOR CHARTRES.

THE vast extent of country comprehended under the name of Mexico is still almost unknown to Europeans in a scientific point of view. The great range of mountains stretching from the river Santiago towards the N., following the line of coast, and inhabited by the Guicholes Indians, has never been explored. Of the manners, customs and language of that tribe we have only a very scanty knowledge. The states of Sonora, Sinaloa, and Chihuahua, have attracted little notice; and the vast extent of country between New Mexico and the United States of America, along the course of the Rio Bravo del Norte, has only been visited by the traders who pass over those regions on their annual journeys from Franklin, on the Missouri, to the Mexican Republic. These few hints may possibly help to direct the attention of travellers to large tracts of country which, as far as physical geography is concerned, may fairly be considered as ground wholly unexplored.

M. Burkart, in the work now before us, has given the result of observations made during a residence of nine years in Mexico. He traversed the country, within a limited space, in various directions, both in his professional character as a manager of mines, in which business he was employed at different times by two English Companies; and, when his immediate duties permitted, he travelled with the direct view of acquiring a more accurate knowledge of the country, and of imparting new information respecting it, particularly with relation to its geology and physical geography. He brought into the field that degree of knowledge which generally belongs to a well-educated German miner, with great perseverance and accuracy of observation; and his work contains a mass of information far exceeding in value anything that has appeared on the same subjects since the travels of Humboldt.

His first destination was Tlalpujahua,\* as he had been engaged as chief miner by the company bearing that name, and he reached that place from Europe by way of Tampico.

In his journey from the coast he experienced the want of a good travelling map, which suggested to him the idea of constructing one; and with this object in view, he made use of all the means in his power to collect materials during his journeys and residence in the country. The result has been a road-map, in which the

\* N.W. of Mexico: Tlalpujahwa (Tlalpuháwa) in our map; *x* and *j* having the same sound in Spanish.—ED.

rivers, streams, towns, villages, farms, single houses, &c., are laid down : it includes 6 degrees of latitude, and  $8\frac{1}{2}$  of longitude. In the centre of this map is Guanaxuato, which point was fixed by Humboldt in  $21^{\circ} 0' 5''$  N. lat., and  $100^{\circ} 54' 38''$  W. long. The author very candidly mentions that his means of laying down positions were limited, with a few exceptions, to compass-bearings corrected by latitudes ; but it is to be regretted that the mountain ranges are not indicated on his map.

The author gives a minute description of the district of Tlalpujahua, its geology and mineral productions. His next journey is from Tlalpujahua by Tula to Atotonilco el Chico, Real del Monte, and Pachuca ; and he gives a detailed account of the group of mountains in which these mining establishments are situate.

In the course of different journies M. Burkart visited the extinct volcano of Toluca, and the active one of Jorullo, with the country lying in its neighbourhood. In the spring of 1828 he quitted the service of the Tlalpujahua Company, after which he went to the Capital, and from thence to the mining districts of Zimapan, Pechuga, San Jozé del Oro, and then by Queretaro and Zelaya to Guanaxuato. He afterwards travelled over the country lying between Guanaxuato and Zacatecas, visiting in his way the warm-springs of Aguas Buenas and Comanilla—and the towns of Leon, Lagos and Aguas Calientes, thence proceeding by the mines of Asientos de Ibarra to Zacatecas.

Shortly after his arrival in that town, in the summer of 1828, he entered into the service of the Bolaños Mining Company, and proceeded to their establishment at Veta Grande, as chief miner of that district. He continued in this capacity for seven years, and has given a very full account of the mines under his charge, accompanied by tables showing their expense and produce during a period of eight years, and a geological map of the district of Zacatecas, with various sections of the ground. While in the employment of the Bolaños Company he made several journies, and visited the mining districts of Fresnillo, Bolaños, Ramos, Catorze, Charcas, Mazapil, &c., all of which he describes with minute detail. He also gives a very interesting section of the country lying between San Blas on the Pacific and Tampico on the Atlantic. The line of this section lies between  $21^{\circ} 30'$  N. and  $23^{\circ}$  N., and shows in a very satisfactory manner the levels of this part of the Mexican table-land from sea to sea.

A few extracts from this work, relating more particularly to physical geography, will give some idea of its value and of the information it conveys :—

“ The Nevado, or Snowy Mountain, called also the Volcano of Toluca, a few leagues W.S.W. of the small town of Toluca, lies, according to

Humboldt, in  $19^{\circ} 11' 33''$  N. lat., and  $104^{\circ} 6'$  W. of Greenwich,\* and 15,263 feet above the sea. On the northern side, at the foot of the Nevado, and at the distance of some leagues from it, is seen the river Lerma, flowing from E. to W. In this direction the lower slopes of the mountain lose themselves imperceptibly in the valley of the Lerma, near the Hacienda of La Huerta, about 2 leagues to the westward of Toluca. The Lerma valley, to the N. of the Nevado, as also E. and W. of that direction, to the distance of more than 25 leagues, is several leagues wide, so that the appellation of an elevated plain is very appropriate: on it are seen the towns of Toluca, Lerma, and Ixtlahuaca, besides several villages and large farms. From the Hacienda de la Huerta, which lies directly N., and at the foot of some lower hills surrounding the Nevado, the distance to the Snowy Mountain, in a direct line, is about 3 leagues. The elevated plain extends itself to the N. and E. from the Hacienda, which, at about 2 leagues N. of La Huerta, is cut by a range of low hills. Many of these, as well as several other isolated ones, assume the form of truncated cones. To the N. and E. the base of the Nevado reaches almost immediately down to the plain: to the S. and W., however, its slopes are connected with important branches of the Cordillera. Fifteen leagues to the N., on the right bank of the Lerma, and directly opposite, is the Cerro de Hacotitlan, a dome-shaped mountain of considerable elevation, and commanding a very extensive view."—p. 186, vol. i.

In his description of his ascent of the Nevado he remarks that the limit of vegetation was at 13,405 feet, after which commenced the line of perpetual snow: this line changes according to the seasons, being generally lowest in the month of January, and highest in September and October. After suffering much fatigue, he found himself on the edge of the crater, 15,076 feet high: this edge was here very narrow, and its interior slope from  $35^{\circ}$  to  $37^{\circ}$ . Some rocks, called *Los Frayles*, form at this point the most elevated summit of the mountain, which is 15,263 feet. The crater is divided into two unequal parts by hills: each of these parts contained water, which stood at a depth of 1374 feet under the edge of the crater. This depth, with the extent of the crater, which was about a mile in diameter, will convey an idea of the eruptions which formerly must have taken place in this volcano. The distance of this mountain from the sea coast is 38 geographical miles to the N.E.; and from Acapulco, towards the S., is from 32 to 33 miles. There are no records of this volcano's having been in activity, and very few indications of lavas having flowed from it exist.

The limits of this Journal will only admit of one more extract, and selected from the author's visit to the volcano of Jorullo:—

"From the Rancho de la Playa de Jorullo the principal volcano lies

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\* In  $19^{\circ} 7' N.$ ,  $99^{\circ} 28' W.$  (J. Arrowsmith's Map) Probably M. von Humboldt took Paris as his first meridian.—ED.

about 2 leagues in an easterly direction. The lava streams, and the up-raising of the ground during the last eruptions in the year 1759, have extended themselves to the vicinity of this rancho; and the ground on this western side, to a distance of  $1\frac{1}{2}$  to 2 leagues round the volcano, has been thrown perpendicularly up. By this upheaving a precipitous height of from 30 to 35 feet has been formed round the mountain, which is accessible only in a few points, and on this side cannot be approached without a guide. I examined this raised part of the ground in several points of its perpendicular sides, and found it to consist invariably of a lightish green, not very compact basalt, with many particles of olivine. From the exterior edge of this elevation, towards the principal volcano, the ground rises with a gentle slope, and it is 2890 feet high. This upheaved land was covered, when Humboldt visited it, with thousands of small cones, called hornitos: their temperature was very high, and they threw out watery vapour. In consequence of the heavy rains which fall in this climate, and the increasing vegetation, a great part of the cones, after a lapse of only twenty-four years, since Humboldt's visit, have entirely disappeared, and others have completely changed their form. Very few of them indicate a higher temperature than that of the surrounding atmosphere—and now hardly any of them evolve vapour. Near the edge of the upheaved ground the small cones are chiefly composed of loose, and often porous basaltic lava, containing much olivine in grains, but, more rarely, conchoidal augite."—p. 227, vol. i.

For a further description of this very interesting volcano the work itself must be consulted; and the following tables will give the heights barometrically measured by the author, and calculated with great care since his return to Europe.

*Heights of Places above the Sea, determined by Barometrical Measurement.*

I. Various Points in the Districts visited.

Places.	English Feet.	Places.	English Feet.
Acaponeta, village . . . . .	213	Avaristos, rancho near Guanajuato . .	7,887
Aguas Buenas, a warm spring, near Guanajuato . . . . .	6,552	Barranca Dedo, not far from Zimapan .	5,548
Aguas Calientes (warm water), city .	6,178	Do. Sonjon, near Villa Seca . . . . .	5,377
Aguilar, farm near Zelaya . . . . .	5,562	Bariga de Plata, mountain near Catorze	9,936
Amialco, a rancho near Tula . . . . .	8,684	Buena Vista, on the road from San Blas to Acaponeta . . . . .	313
Angango, house of the German Mining Association . . . . .	8,519	Bufo of Guanajuato . . . . .	8,270
Angeles (angels), a mountain near Catorze . . . . .	10,368	Cadereita, town . . . . .	6,749
Anonas, rancho . . . . .	1,343	Calera del Sauce, plain between Zacatecas and Ramos . . . . .	6,745
Apaseo, a village . . . . .	5,944	—, rancho in the plain between Veta Grande and Fresnillo . . . .	7,064
Arevalo, a mine . . . . .	7,691	—, rancho near Queretaro . . . . .	5,669
Arroyo Zarco, a farm . . . . .	8,317	Cangando, mountain near Encarnacion, not far from Zimapan . . . .	9,130
Arroyo de en Medio, rancho near Fresnillo . . . . .	7,043	Cantera, mountain near Catorze . .	9,669
Asientos de Ibarra, a mining station .	7,064	Capula, village . . . . .	7,553
Atotonilco el Chico, do. . . . .	7,739	Catorze, los A/lamos de, mining station	8,785

Places.	English Feet.	Places.	English Feet.
Catorze, Cañada de, amalgam-house .	7,022	Jacal, or Nabajas, mountain near Real	
Charcas, mining station . . . .	6,928	del Monte . . . . .	10,416
Charo, village . . . . .	6,105	Javalí, rancho not far from Rio de las	
Cedral, do. near Catorze . . . .	7,528	Balsas . . . . .	984
Chichimiquillas, farm not far from		Jordana, farm . . . . .	8,393
Guanaxuato . . . . .	6,552	Jorullo, foot of the volcano . . . .	2,890
Cazadera, do. near San Juan del Rio	7,629	——— N.W. edge of the crater . .	4,150
Colorados, do. . . . .	6,050	——— N.E. edge of the crater . .	4,124
Cornejo, lake and rancho . . . .	6,473	Lagos, city . . . . .	6,208
Comanja, mining station . . . .	7,212	Lerma, town . . . . .	8,558
Comanilla, bath . . . . .	6,407	——— bridge not far from the	
Cross on the road from Chico to Pachuca	9,339	farm La Jordana . . . . .	8,196
Crucitas, rancho . . . . .	830	Leon, city . . . . .	6,006
Dedo, baranca near Zimapan . . .	5,548	Manzanas, brook near Real del Monte	9,456
Dolores, galleries near Catorze . .	8,685	Maravatllo, town . . . . .	6,735
———, shaft near Real del Monte .	10,060	Mesa del Cerillo, mountain near Za-	
Edificios, ruins not far from Zacatecas	7,407	catecas . . . . .	8,938
Encarnacion, smelting-house not far		Mesa da Tlalpujahua, mountain near	
from Zimapan . . . . .	7,486	Tlalpujahua . . . . .	9,739
Escalera, amalgam-house at Guana-		Mezon de San Pedro, at Zacatecas .	7,305
xuato . . . . .	6,870	Mexico, capital . . . . .	7,426
Esperanza, farm not far from Queretaro	6,320	Milagros, pit near Catorze . . . .	9,150
Estancia de la Vacas, cow-stall on the		Milpillas, rancho in the Sierra de	
road from Tlalpujahua to Tula . .	8,822	San Mateo . . . . .	7,814
Etra, rancho not far from Zacatecas .	6,124	Mingoli, farm . . . . .	7,340
Frailtes, highest point in the Nevado		Moctezuma, Rio de, stream not far	
de Toluca . . . . .	15,263	from Zimapan, on the Paso de las	
Fresnillo, mining station . . . .	7,227	Maromas . . . . .	6,022
Gallo, mountain near Tlalpujahua .	9,239	Moran, mouth of the galleries at Real	
Garcías, rancho de los, not far from		del Monte . . . . .	8,402
Xeres . . . . .	8,288	Nabajas or Jacal, mountain at Real	
Gilotepec, village . . . . .	7,842	del Monte . . . . .	10,416
Guadalupe el Carnizero, farm . . .	6,352	Naranjo (orange), a rancho . . . .	2,286
——— convent near Zacatecas . .	7,475	Nevado de Toluca, highest rock, Los	
Guajicoria, village . . . . .	301	Frailtes (the friars) . . . . .	15,263
Guajimalpa, farm . . . . .	9,474	Nevado de Toluca, edge of the crater	15,076
Guajolote, mountain near Real del		——— surface of the lake . . . .	13,847
Monte . . . . .	9,512	——— extreme limit of ve-	
Guajolote, a rancho . . . . .	8,914	getation . . . . .	13,405
Guardarey, pit near Comanjo . . .	7,650	Ordefa, shepherd's house on the Ne-	
Guanaxuato, city . . . . .	6,869	vado de Toluca . . . . .	11,878
Hedehonda, rancho . . . . .	6,664	Oro, San José del, mountain . . . .	8,459
Hocotillan, rancho and warm spring .	8,241	Pachuca, mining station . . . . .	8,114
Height between Tlalpujahua and An-		Palma, rancho near Pinos . . . . .	6,823
gangeo . . . . .	10,466	Panuco, smelting-house near Zacatecas	7,621
Height between Estancia and San		Paso de Tierra Caliente, rancho . .	1,851
Andres . . . . .	9,423	Pate, warm springs and farm . . . .	5,204
Height between San Andres and Gilo-		Patzcuaro, lake . . . . .	7,075
tepec . . . . .	8,565	Pechuga, mining station . . . . .	5,371
Height between Tandaja and Tula . .	7,811	Pedernal, rancho . . . . .	6,624
Height between Ilguautla and Chico .	9,443	Peregrino, pit near Guanaxuato . .	8,305
Height between Chico and Real del		Popocatepetl . . . . .	17,773
Monte . . . . .	9,684	Puerto de Casa blanca . . . . .	7,404
Height between Tlalpujahua and Te-		Puerto del Campo Santo, near San	
petillan . . . . .	9,072	José del Oro . . . . .	8,509
Huerta, farm near Tula . . . . .	9,268	Puerto Ismiquilpan de . . . . .	8,303
Ilguautla, village . . . . .	7,994	Puerto, between the ranchos Majadas	
Indaparapeo, village . . . . .	6,345	and Pilas . . . . .	6,022
Ismiquilpan, village . . . . .	5,584	Puerto San Pedro, near Xeres . . .	8,671
———, Puerto de . . . . .	8,303	Puerto S. Rumo, near Guanaxuato .	8,142
Istlahuaca, or Ixtlahuaca . . . .	8,293	Puerto Santa Rosa, at Guanaxuato .	8,932

Places.	English Feet.	Places.	English Feet.
Punta, farm at Zacatecas . . .	6,411	San Juan del Rio . . .	6,433
Purissima Concepcion, pit at Catorze	9,824	San Juan, shaft near Real del Monte	9,382
Purissima Concepcion, smelting-works at Chico . . .	7,356	San Juan del Tusal, rancho on the road to Catorze . . .	6,793
Quates, farm at Cadereita . . .	6,696	San Lorenzo, chapel near Tlalpujahua	8,466
Quemada, farm at Villa Nueva . . .	6,537	San Mateo, farm not far from Mexico	7,651
Quemado, Cerro, at Catorze . . .	9,358	San Pablo, farm near Pechuga . . .	4,791
Queretaro, town . . .	6,076	San Pedro de la Boca, village near Xeres . . .	7,163
Ramos, mining station . . .	7,008	San Pedro, puerto, not far from Xeres . . .	8,671
Rayas, head shaft of the pit Rayas, at Guanaxuato . . .	7,270	San Pedro de Tlacuapan, near Tula	6,732
Real del Monte, mining station . . .	8,937	San Rafael, mountain near Guanaxuato . . .	9,078
Refugio, galleries at Catorze . . .	8,668	San Rafael, smelting-works near Aguas Calientes . . .	8,591
Regla, smelting and casting works at Real del Monte . . .	6,610	San Jacinto, farm between Zacatecas and Aguas Calientes . . .	6,453
Rio (stream), Añadío, at Tusanla . . .	4,579	Santa Cruz, farm at Fresnillo . . .	7,007
Rio Grande de Santiago, at Lerma . . .	8,558	Santa Rosa, mountain not far from Tlalpujahua . . .	9,252
Rio Grande de Santiago, near Istlahuaca	8,293	Santa Rosa, shaft of the pit, Rayas at Guanaxuato . . .	7,203
Rio Grande de Santiago, near La Jordana	8,196	Santa Rosa, puerto, not far from Guanaxuato . . .	8,932
Rio Grande de Santiago, on the road from Bolaños to Tepic . . .	575	Tajamanil, farm . . .	2,792
Rio Moctezuma, on the Paso las Maromas near Zimapan . . .	4,769	Tandeja, farm near Tula . . .	7,421
Rio las Balsas, near Sirisicuaró . . .	879	Tarimangacho, mountain at Tlalpujahua . . .	10,186
Rio las Balsas, near the farm Cutio . . .	697	Tecama, village near Mexico . . .	7,206
Rio San Pedro, near Santiago . . .	180	Temascatio, farm not far from Guanaxuato . . .	5,866
Rio Zitacuaro, near Tusanla . . .	2,191	Tepetitlan, farm not far from Tlalpujahua . . .	8,368
Rio Zitacuaro, near Tiquicheo . . .	1,455	Tepesala, mining station not far from Asientos de Ibarra . . .	6,939
Rosa Morada, farm . . .	196	Tiquicheo, village by the Rio Zitacuaro . . .	1,455
Saca Mecate, rancho in the mountains of Xeres . . .	8,321	Tigre, rancho near Villeta de la Encarnacion . . .	6,169
Salinas, village and lake . . .	6,653	Telepango, farm near Tula . . .	6,851
Sancangerito, rancho . . .	2,409	Tlalpujahua, mining station . . .	8,388
Sanchez, smelting-works near Real del Monte . . .	8,022	Trinidad, pit near San José el Oro . . .	7,956
Sauceda, farm in the valley of Valparaíso . . .	6,939	Trujillo, farm near Fresnillo . . .	6,905
Sauces, Mezon between Lagos and Aguas Calientes . . .	6,157	Toluca, town . . .	8,698
Serena, mountain near Guanaxuato . . .	8,379	Tolimán, near Zimapan . . .	4,973
Silao, small town . . .	5,809	Tula, by the Rio Moctezuma, town . . .	6,783
Somera, mountain near Tlalpujahua . . .	9,806	Tulancingo, farm near Tula . . .	7,011
San Andres, village . . .	8,638	Tusanla, village . . .	2,117
San Christobal, mouth of the galleries near Tlalpujahua . . .	8,706	Valladolid, village . . .	6,291
San Esteban, discharging-place at the shaft near Tlalpujahua . . .	8,708	Valparaíso, bath . . .	6,398
San Felipe, village not far from Tlalpujahua . . .	8,341	Villalpando, pit not far from Guanaxuato . . .	8,457
San Felipe, stream between Angango and Zitacuaro . . .	7,305	Villalpando, mountain . . .	9,453
San Felipe, village not far from Guanaxuato . . .	6,909	Villa Nueva, small town . . .	6,281
Santiago, village not far from San Blas . . .	116	Villa Seca, mountain not far from Zimapan . . .	7,148
San Isidro, rancho not far from Catorze . . .	5,833	Zamora, mountain near Ramos . . .	7,763
San José, stream between Tlalpujahua and Angango . . .	8,368	Zimapan, mining station . . .	5,624
San José del Oro, chapel on the mountain not far from Zimapan . . .	8,459	Zitacuaro . . .	6,453

## II. Section of the Mountains from San Blas, through Tepic, Bolaños, Zacatecas, San Luis Potosí, and Tula, to Tampico de Tamaulipas.

### Heights measured above the Level of the Sea.

Places.	English Feet.	Places.	English Feet.
San Blas, port-town . . . . .	90	Cacalote, rancho . . . . .	6,185
Lajitas, rancho . . . . .	2,552	Xeres, town . . . . .	6,592
Tepic, town . . . . .	2,930	Veta Grande, mining station . . . . .	8,550
Mora, sugar-plantation . . . . .	2,882	Zacatecas, town . . . . .	7,978
Pochotitlan, village . . . . .	2,607	Angel, mountain . . . . .	8,949
Rio Grande, bed of the river in the road . . . . .	575	Sauceda, smelting-works . . . . .	7,530
Paraje de los Bancos . . . . .	2,880	Ojocaliente, town . . . . .	6,716
Cuesta de Halica . . . . .	5,793	Santiago, mountain . . . . .	8,530
Cuesta de los Huicholes . . . . .	3,927	La Blanca, smelting-works . . . . .	6,723
Huasquimia, rancho . . . . .	3,710	Angeles, mining station . . . . .	7,474
Height between Camotlan and Huasquimia . . . . .	7,316	La Palma, rancho . . . . .	6,823
Comotlan, farm . . . . .	3,868	Peñon Blanco, mountain . . . . .	8,917
Mouth of the stream Tlascala into the Camotlan . . . . .	3,569	Pinos, mining station . . . . .	7,982
Cuesta de Tlascala . . . . .	7,323	Cerro de la Cruz, mountain . . . . .	9,657
Chibo, mountain east of the road . . . . .	8,900	Sauce Gordo, rancho . . . . .	6,775
Berberia, rancho . . . . .	8,130	San Luis Potosí, town . . . . .	5,961
Bolaños, market-place, cashier's office . . . . .	3,090	Peotillas, farm . . . . .	4,829
Bolaños in the despacho . . . . .	3,173	Guaji, rancho . . . . .	5,706
Aguila, mountain . . . . .	5,486	Guadalcazar, mining station . . . . .	5,236
Pinal, mountain, eastern summit of . . . . .	7,526	Hincada, farm . . . . .	3,709
Salitre, village . . . . .	5,826	Tula, village . . . . .	3,844
Tototiche, village . . . . .	6,059	Puerto de los Gallos, mountain . . . . .	4,604
Atotolco, rancho . . . . .	5,896	Cuesta de la Contadera . . . . .	2,790
Cartagena, village . . . . .	5,330	Santa Bárbara, village . . . . .	1,134
Colotlan, village . . . . .	5,560	Rio Limones, stream and rancho . . . . .	128
Santa Maria, village . . . . .	5,661	Horcasitas, village* . . . . .	82
Santa Maria, mountain . . . . .	7,503	Gualul, rancho . . . . .	205
		Esteros, small lakes . . . . .	40
		Altamira, village . . . . .	90
		Tampico de Tamaulipas, town . . . . .	50

### III. Heights determined in the Mountains of Zacatecas.

#### 1. Valley of Zacatecas.

Places.	English Feet.	Places.	English Feet.
Height near Cata de Mulas . . . . .	8,614	Smelting-works, San Tadeo . . . . .	7,698
Grube San Bernabe, principal shaft . . . . .	8,379	Guadalupe . . . . .	7,564
Powder-mill of Bracho . . . . .	8,121	Sauceda . . . . .	7,530
City of Zacatecas . . . . .	7,978		
Smelting-works, Florida . . . . .	7,745		
Granja . . . . .	7,560		
Bermudez . . . . .	7,673		
Stream below the Convent, Guadalupe . . . . .	7,475		

#### 2. Valleys of Leones and Polvorista.

Puerto San Francisco . . . . .	8,789
Smelting-works, in ruins, Leones . . . . .	8,203
Polvorista . . . . .	7,560
Stream in the lower part of the farm of Guerreros . . . . .	7,422

#### 3. Valley of Sauceda.

Puerto de Veta Grande . . . . .	8,773
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#### 4. Valley of Arzola.

Puerto between the mountains of San Felipe and Bisnaja . . . . .	8,316
Junction of the Valleys of Arzola and Anis . . . . .	7,491
Arroyo Arzola in the plain . . . . .	7,320

#### 5. Valley of Panuco.

Puerto, near la Virgenes . . . . .	8,302
Noria, near Buen Suceso . . . . .	7,676
Bed of a river below Panuco . . . . .	7,557
Gutierrez, rancho . . . . .	7,316

#### 6. Valley of La Sacra Familia.

Point where the Aqueduct of Zacatecas begins . . . . .	8,045
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\* This and the four following heights appear not to be entirely free from error, as a high wind caused the barometer to fall very low.



Places.	English Feet.
Smelting-works, Cinco Señores . . .	7,941
Huerta Senguilla de arriba . . .	7,615
— de abajo . . .	7,553

7. *Valley of Pimienta and Calabera.*

Puerto del Cerro Plomoso . . .	8,548
Bed of a river near the pit of Nueva Valenciana . . .	8,093
Bed of a river . . .	7,845
Plain . . .	7,619

8. *Valley la Plata.*

Puerto de Malanoche . . .	8,491
Smelting-works, la Plata . . .	8,136
Garden of el Gil . . .	7,888
Plain below the Ladrillera . . .	7,618

9. *Valley la Chica.*

Puerto de la Veta Grande . . .	8,773
Smelting-works, la Chica . . .	8,236
First house of Hacienda Nueva . . .	7,845
Plain below la Troja . . .	7,642

10. *Valley of Bracho and la Pila.*

Puerto, near Teposan . . .	8,643
Rancho Bracho . . .	7,810
Plain below the rancho la Pila . . .	7,570

11. *Valley of Chupaderos.*

Pit Gallega . . .	8,470
Bed of the river above Chupaderos . . .	7,618
Plain below Chupaderos . . .	7,544

12. *Valley of Muleros.*

Puerto de Armados . . .	8,696
Road from Guadalupe to Panaco, in the bed of the river . . .	8,014
Plain below Muleros . . .	7,514

13. *Ridge dividing the waters between the two plains of Bañuelos and Fresnillo.*

Highest point on the Mesa del Cerrillo . . .	8,938
Cerro del Viejo . . .	8,229
Shaft of the Aqueduct of Zacatecas . . .	8,045
Cerro del Grillo . . .	8,721
Cerro de la Llamarada . . .	8,552
Cerro de la Malanoche . . .	8,672
Llano de los Loyotes (pit Concordia) . . .	8,580
Cerro del Huachichil . . .	8,890
Cerro Milanesa . . .	8,859
Cerro Armados . . .	8,720
Llano las Virgenes . . .	8,302
Mountain on the road to Matapulgas . . .	7,999

14. *Heights of chains and single mountains.*

Places.	English Feet.
Cerro Milanesa . . .	8,859
— San Acasio . . .	8,904
— el Angel . . .	8,949
— Miradillo . . .	8,426
— Maestranste . . .	8,459
— Papanton . . .	8,303
— Cantera . . .	8,124
— Guerreros . . .	8,005
— Aqua Salada . . .	8,094
— Buenavista . . .	8,532
— San Martin . . .	8,602
— la Bufa . . .	8,859
— del Infante . . .	8,111
— Matapulgas . . .	7,705
— Mesa del Cerrillo, highest point . . .	8,938
— S.E. point of the same . . .	8,916
— las Canteras . . .	7,956
— los Padres . . .	8,385
— las Huertas . . .	8,178
— la Nueva Valenciana . . .	8,392
— la Pimienta . . .	8,248
— San Jorge . . .	8,437
— Plomillo . . .	8,497
— Calicanto . . .	8,894
— Magistral . . .	8,664
— Frijol . . .	8,429
— la Sierpe . . .	8,688
— el Gil . . .	8,513
— la Chica . . .	8,912
— Desierto . . .	8,233
— la Palma . . .	8,109
Pits of Guadalupe, near Veta Grande . . .	8,173
Llano de las Virgenes . . .	8,302
Pit of Descubrimiento . . .	7,825
Cerro del Pilar, near Chupaderos . . .	7,852
— Armados . . .	8,720
— Zapopa . . .	8,071
— Don Antonio, beyond Muleros . . .	8,156
— Carozza . . .	8,039
— San Felipe . . .	7,999
— el Moro . . .	8,000
— de los Tajos de Panuco . . .	7,904
Loma de San Joaquin . . .	7,773
Cerro Tescuco . . .	7,886
— Bisnaga . . .	8,427
— Lechuguilla . . .	7,997
— Palenque . . .	8,460
— Quemado . . .	8,065
— Hornitos . . .	8,081
— Tadeo . . .	8,301
— Saucillo . . .	8,215
— Saucedá . . .	7,983